

# OAK RIDGE NATIONAL LABORATORY

OPERATED BY  
UNION CARBIDE CORPORATION  
NUCLEAR DIVISION



POST OFFICE BOX X  
OAK RIDGE, TENNESSEE 37830

April 9, 1975

Dr. James L. Liverman  
Assistant Administrator for  
Environment and Safety  
U. S. Energy Research and  
Development Administration  
Washington, D. C. 20545

Dear Dr. Liverman:

Enclosed are copies of recent correspondence from my good friend, Dr. Eduardo Ramos. I am also sending copies of this correspondence to Martin Minthorn and Gordon Facer (DMA) as I have attempted to keep each of them up to date on what I know about Project Indalo.

I will send you some specific suggestions for your consideration later in the week.

Warmest personal regards.

Sincerely yours,

*Chester R. Richmond /crr*

Chester R. Richmond  
Associate Director for  
Biomedical and Environmental  
Sciences

CRR:lm

Enclosures

cc: H. D. Bruner  
G. C. Facer  
M. L. Minthorn, Jr.



MAR 26 1975

MINISTERIO DE INDUSTRIA  
JUNTA DE ENERGIA NUCLEAR

Madrid, 17 de Marzo l. 975

Dr. Chester R. Richmond  
Associate Director for Biomedical and Environmental Sciences  
Oak Ridge National Laboratory

Dear Chest:

I think you have met Dr. Malboyson who carried out a letter from me to you as introduction. I hope you have talked pleasantly about his bussines. To day I have a very bad new. My wife have died past 27th February almost suddently - a cardiac arrest - when she were to be operated on of a umbilical hernia. We have suffered very much in those days and now very slowly are resovering.

I wish to remember to you that we are awaiting the Pu-242 to follow our analysis of the different samples, mainly those of bones and livers.

My time is arrived and next 27th I will finish my term as official employee of this Junta. I do not know if some particular linkage will remain with me but until now I only can say goodway. Emilio will follow with the Project and he will care of the next measurements of people who will begin to came after the Holly week (23th to 30th). I will be at Cartagena with my son all the Holly Week and will be back again 3th or 4th April. Then, perhaps I will know how the things has been arranged.

With my best regards

sincerely

-Dr. Eduardo Ramos  
Inspector General de Protección y Seguridad.

P. S. - I wish to know your comments on the new measurements of people I sent lately .



MINISTERIO DE INDUSTRIA  
JUNTA DE ENERGIA NUCLEAR

MAR 3 1975

*Recibido*  
*5/3/75*  
*MINISTRO*

Madrid, 24 de Febrero 1. 975

Dr. Chester R. Richmond  
Associate Director for Biomedical and Environmental Sciences  
Oak Ridge National Laboratory  
Union Carbide Corporation  
Nuclear Division  
Post Office Box X  
Oak Ridge, Tennessee 37830 (USA)

Dear Chest:

Your translation of our humble papers arrived at time. I has been engaged on meetings and several travels to the Navy Shipyards in Ferrol, Cartagena and Cádiz and it has been impossible to get time to write to you. Now I am more tranquil and I wish to send to you the copy of the seven firsts measurements made on people of Palomares. Almost all of them have been here before and were measured with the old equipment. Now you can see how all of them show measurable quantities of Pu. We collected urine to look for Pu. When I get the results I will send its to you. I think that the measurements are very intresting because after now eight years they show very clearly their lung burdens in Pu. I hope that more people will come in the next weeks. It is important to consider the results in the girl.

Now we prepared to confront the data on the winds directions and these of the measurements on filter papers at the same days and to make curves of resuspension, according with those data.

I think that it is worthwhile to follow this search seen this findings. People of Northen Scientific through that of UNITRONICS S. A. sent a technician with the good look that the analyzer was runing perfectly at that time. However he take good note of the troubles and told us that in the future ne will care of the instruments. So, be you sure that everything will go well.

How are the things in your new position ?. Here we are in another "reorganization" and nobody know which is their job if any. I will remain here until next Marz. After the 27 th I will enter in the retained postion and till now I do not know if some kind of connexion will have with this Junta.

With my best regards

Sincerely

-Dr. Eduardo Ramos-

Inspector General de Protección y Seguridad

# CONTADOR DE RADIATIVIDAD CORPORAL

SERIE N°

13

APELLIDOS:

NOMBRE

PROCEDECIA PAJONALES (Almería)

FECHA 17 FEBRERO

ESPEJOR TORACICO 1'92 cm

CAN 12-24	377	C.T.	0'189	c/s	CAN 75-100	0'699	x	0'163	=	0'114	FONDO CORPORAL EN c/s	CAN 12-24
CAN 50-70	1590	C.T.	0'1795	c/s	CAN 75-100	0'699	x	0'1983	=	0'1687	FONDO CORPORAL EN c/s	CAN 50-70
CAN 75-100	1399	C.T.	0'699	c/s	CAN 12-24	0'189	-	0'114	=	0'075	c/s NETAS	
					CAN 50-70	0'795	-	0'1687	=	0'108	c/s NETAS	

## EVALUACION DE Am-241

c/s CAN 50-70 0'108 x C<sub>f</sub> Am-241 3'1 = 0'335 : 0'126 nCi DE Am-241

## EVALUACION DE LA FRACCION DE Am-241 EN CAN 12-24

c/s CAN 50-70 0'108 x E<sub>f</sub> 0'183 = 0'020 = FRACCION Am-241 EN CAN 12-24

## EVALUACION DE Pu-239 EXISTIENDO Am-241

c/s CAN 12-24 0'075 - FRACCION Am-241 0'020 = 0'055 c/s NETAS DE Pu-239

c/s CAN 12-24 0'055 x C<sub>f</sub> Pu-239 500 = 27'500 : 15'552 nCi DE Pu-239

## EVALUACION DE Pu-239 NO EXISTIENDO Am-241

c/s CAN 12-24 x C<sub>f</sub> Pu-239 = nCi Pu-239

## EVALUACION DE Pu-238

c/s CAN 12-24 0'075 - FRACCION Am-241 0'020 = 0'055 c/s NETAS DE Pu-238

c/s CAN 12-24 0'055 x C<sub>f</sub> Pu-238 230 = 12'650 : 7'154 nCi Pu-238

# CONTADOR DE RADIATIVIDAD CORPORAL

SERIE Nº

1

APELLIDOS:

NOMBRE:

ESPEJOR TORACICO: 2'05 cm

PROCEDENCIA: (PAIOMARES (ALBERTA))

FECHA: 17 FEBRERO

CAN 12-24	398	C.T.	0'199	c/s	CAN 75-100	0'855	x	0'163	=	0'139	FONDO CORPORAL EN c/s CAN 12-24
CAN 50-70	1854	C.T.	0'927	c/s	CAN 75-100	0'855	x	0'983	=	0'840	FONDO CORPORAL EN c/s CAN 50-70
CAN 75-100	1710	C.T.	0'655	c/s	CAN 12-24	0'199	-	0'139	=	0'060	c/s NETAS
					CAN 50-70	0'927	-	0'840	=	0'087	c/s NETAS

EVALUACION DE Am-241

$$c/s \text{ CAN } 50-70 \quad 0'087 \quad \times \quad C_f \text{ Am-241} \quad 3'2 \quad = \quad 0'278 \quad : \quad 0'147 \quad nCi \text{ DE Am-241}$$

EVALUACION DE LA FRACCION DE Am-241 EN CAN 12-24

$$c/s \text{ CAN } 50-70 \quad 0'087 \quad \times \quad E_f \quad 0'178 \quad = \quad 0'015 \quad = \text{FRACCION Am-241 EN CAN 12-24}$$

EVALUACION DE Pu-239 EXISTIENDO Am-241

$$c/s \text{ CAN } 12-24 \quad 0'060 \quad - \quad \text{FRACCION Am-241} \quad 0'015 \quad = \quad 0'045 \quad c/s \text{ NETAS DE Pu-239}$$

$$c/s \text{ CAN } 12-24 \quad 0'045 \quad \times \quad C_f \text{ Pu-239} \quad 545 \quad = \quad 24'525 \quad : \quad 10'845 \quad nCi \text{ DE Pu-239}$$

EVALUACION DE Pu-239 NO EXISTIENDO Am-241

$$c/s \text{ CAN } 12-24 \quad \text{---} \quad \times \quad C_f \text{ Pu-239} \quad \text{---} \quad = \quad \text{---} \quad : \quad \text{---} \quad nCi \text{ Pu-239}$$

EVALUACION DE Pu-238

$$c/s \text{ CAN } 12-24 \quad 0'060 \quad - \quad \text{FRACCION Am-241} \quad 0'015 \quad = \quad 0'045 \quad c/s \text{ NETAS DE Pu-238}$$

$$c/s \text{ CAN } 12-24 \quad 0'045 \quad \times \quad C_f \text{ Pu-238} \quad 250 \quad = \quad 11'250 \quad : \quad 4'975 \quad nCi \text{ Pu-238}$$

# CONTADOR DE RADIATIVIDAD CORPORAL

SERIE N°

130

APELLIDOS

NOMBRE

SPESOR IORACICO 1'39 cm.

PROCEDENCIA PLUMETES (ALBERTA)

FECHA 19 FEBRERO

AN 12-24	346	C.T.	0'173	c/s	CAN 75-100	0'700	x	0'163	=	0'114	FONDO CORPORAL EN c/s CAN 12-24
AN 50-70	1366	C.T.	0'683	c/s	CAN 75-100	0'700	x	0'933	=	0'666	FONDO CORPORAL EN c/s CAN 50-70
AN 75-100	1400	C.T.	0'700	c/s	CAN 12-24	0'173	-	0'114	c/s	FONDO CORPORAL =	0'059 c/s NETAS
					CAN 50-70	0'683	-	0'688	c/s	FONDO CORPORAL =	c/s NETAS

VALUACION DE Am-241

1/5 CAN 50-70 x C<sub>f</sub> Am-241 = nCi DE Am-241

VALUACION DE LA FRACCION DE Am-241 EN CAN 12-24

1/5 CAN 50-70 x E<sub>f</sub> = FRACCION Am-241 EN CAN 12-24

VALUACION DE Pu-239 EXISTIENDO Am-241

1/5 CAN 12-24 - FRACCION Am-241 = c/s NETAS DE Pu-239

1/5 CAN 12-24 x C<sub>f</sub> Pu-239 = nCi DE Pu-239

VALUACION DE Pu-239 NO EXISTIENDO Am-241

1/5 CAN 12-24 0'059 x C<sub>f</sub> Pu-239 300 = 17'700 : 5'906 nCi Pu-239

VALUACION DE Pu-238

1/5 CAN 12-24 - FRACCION Am-241 = c/s NETAS DE Pu-238  
1/5 CAN 12-24 0'059 x C<sub>f</sub> Pu-238 135 = 7'965 : 2'654 nCi Pu-238

# CONTADOR DE RADIACTIVIDAD CORPORAL

SERIE Nº

13

APELLIDOS:

NOMBRE:

ESPEJOR TORACICO 1'86 cm

PROCEDENCIA PIONEROS (ATLANTA)

FECHA: 19 FEBRERO

CAN 12-24 279 c.t. 0'140 c/s  
CAN 50-70 1355 c.t. 0'678 c/s  
CAN 75-100 1471 c.t. 0'736 c/s

c/s CAN 75-100 0'736 x 0'163 = 0'120 FONDO CORPORAL EN c/s CAN 12-24  
c/s CAN 75-100 0'736 x 0'903 = 0'723 FONDO CORPORAL EN c/s CAN 50-70  
c/s CAN 12-24 0'140 - 0'120 c/s FONDO CORPORAL = 0'020 c/s NETAS  
c/s CAN 50-70 0'678 - 0'723 c/s FONDO CORPORAL = c/s NETAS

EVALUACION DE Am-241

c/s CAN 50-70 x C<sub>f</sub> Am-241 = n ci DE Am-241

EVALUACION DE LA FRACCION DE Am-241 EN CAN 12-24

c/s CAN 50-70 x E<sub>f</sub> = FRACCION Am-241 EN CAN 12-24

EVALUACION DE Pu-239 EXISTIENDO Am-241

c/s CAN 12-24 - FRACCION Am-241 = c/s NETAS DE Pu-239

c/s CAN 12-24 x C<sub>f</sub> Pu-239 = n ci DE Pu-239

EVALUACION DE Pu-239 NO EXISTIENDO Am-241

c/s CAN 12-24 0'020 x C<sub>f</sub> Pu-239 455 = 9'300 : 7'995 n ci Pu-239

EVALUACION DE Pu-238

c/s CAN 12-24 - FRACCION Am-241 = c/s NETAS DE Pu-238

c/s CAN 12-24 0'020 x C<sub>f</sub> Pu-238 215 = 4'300 : 3'696 n ci Pu-238

# CONTADOR DE RADIATIVIDAD CORPORAL

SERIE N°

130

APELLIDOS:

NOMBRE:

ESPEJOR TORACICO 1'29 cm

PROCEDENCIA PALOMARES (JALISCO) FECHA 19 FEBRERO

CAN 12-24	309	C.T.	0'135	c/s	CAN 75-100	0'675	x	0'163	=	0'110	FONDO CORPORAL EN c/s CAN 12-24
CAN 50-70	1257	C.T.	0'622	c/s	CAN 75-100	0'675	x	0'983	=	0'664	FONDO CORPORAL EN c/s CAN 50-70
CAN 75-100	1350	C.T.	0'675	c/s	CAN 12-24	0'155	-	0'110	=	0'045	c/s NETAS
FONDO CORPORAL =											
c/s CAN 50-70 0'629 - 0'664 c/s FONDO CORPORAL = c/s NETAS											

EVALUACION DE Am-241

c/s CAN 50-70 x C<sub>f</sub> Am-241 = nCi DE Am-241

EVALUACION DE LA FRACCION DE Am-241 EN CAN 12-24

c/s CAN 50-70 x E<sub>f</sub> = FRACCION Am-241 EN CAN 12-24

EVALUACION DE Pu-239 EXISTIENDO Am-241

c/s CAN 12-24 - FRACCION Am-241 = c/s NETAS DE Pu-239

c/s CAN 12-24 x C<sub>f</sub> Pu-239 = nCi DE Pu-239

EVALUACION DE Pu-239 NO EXISTIENDO Am-241

c/s CAN 12-24 0'045 x C<sub>f</sub> Pu-239 270 = 12'150 : 4'886 nCi Pu-239

EVALUACION DE Pu-238

c/s CAN 12-24 - FRACCION Am-241 = c/s NETAS DE Pu-238

c/s CAN 12-24 0'045 x C<sub>f</sub> Pu-238 120 = 5'400 : 2'173 nCi Pu-238



# CONTADOR DE RADIACTIVIDAD CORPORAL

SERIE N°

13

APELLIDOS:

NOMBRE:

ESPEJOR TORACICO 1'11 cm

PROCEDENCIA FLORES (ALPERL)

FECHA 19 FEBRER

CAN 12-24	237	C.T.	0'119	c/s	CAN 75-100	0'413	x	0'163	=	0'067	FONDO CORPORAL EN c/s	CAN 12-24
CAN 50-70	746	C.T.	0'374	c/s	CAN 75-100	0'413	x	0'983	=	0'406	FONDO CORPORAL EN c/s	CAN 50-70
CAN 75-100	825	C.T.	0'413	c/s	CAN 12-24	0'119	-	0'067	=	0'052	c/s NETAS	
					CAN 50-70	0'374	-	0'406	=		c/s FONDO CORPORAL =	
											c/s NETAS	

EVALUACION DE Am-241

c/s CAN 50-70 x C<sub>f</sub> Am-241 = nCi DE Am-241

EVALUACION DE LA FRACCION DE Am-241 EN CAN 12-24

c/s CAN 50-70 x E<sub>f</sub> = FRACCION Am-241 EN CAN 12-24

EVALUACION DE Pu-239 EXISTIENDO Am-241

c/s CAN 12-24 - FRACCION Am-241 = c/s NETAS DE Pu-239

c/s CAN 12-24 x C<sub>f</sub> Pu-239 = nCi DE Pu-239

EVALUACION DE Pu-239 NO EXISTIENDO Am-241

c/s CAN 12-24 0'052 x C<sub>f</sub> Pu-239 220 = 11'440 : 3'540 nCi Pu-239

EVALUACION DE Pu-238

c/s CAN 12-24 - FRACCION Am-241 = c/s NETAS DE Pu-238

c/s CAN 12-24 0'052 x C<sub>f</sub> Pu-238 100 = 5'200 : 1'611 nCi Pu-238

# CONTADOR DE RADIACTIVIDAD

CORPORAL

SERIE N°

130

APELLIDOS:

NOMBRE

ESPEJOR TORACICO 1'52 cm.

PROCEDENCIA PLOMARIOS (AITEE L.)

FECHA 19 FEBRERO

CAN 12-24	313	C.T.	0'157	c/s	C/S CAN 75-100	0'666	x	0'163	=	0'109	FONDO CORPORAL EN C/S CAN 12-24
CAN 50-70	1413	C.T.	0'707	c/s	C/S CAN 75-100	0'666	x	0'983	=	0'655	FONDO CORPORAL EN C/S CAN 50-70
CAN 75-100	1332	C.T.	0'666	c/s	C/S CAN 12-24	0'157	-	0'109	=	0'046	C/S NETAS
					C/S CAN 50-70	0'707	-	0'655	=	0'052	C/S NETAS

EVALUACION DE Am-241

$$C/S CAN 50-70 \times C_f Am-241 = 2'7 = 0'140 + 0'096 \text{ nCi DE Am-241}$$

EVALUACION DE LA FRACCION DE Am-241 EN CAN 12-24

$$C/S CAN 50-70 \times E_f = 0'219 = 0'011 = \text{FRACCION Am-241 EN CAN 12-24}$$

EVALUACION DE Pu-239 EXISTIENDO Am-241

$$C/S CAN 12-24 \times 0'018 - \text{FRACCION Am-241} = 0'011 = 0'037 \text{ c/s NETAS DE Pu-239}$$

$$C/S CAN 12-24 \times 0'037 \times C_f Pu-239 = 340 = 12'560 + 4'998 \text{ nCi DE Pu-239}$$

EVALUACION DE Pu-239 NO EXISTIENDO Am-241

$$C/S CAN 12-24 \times C_f Pu-239 = \dots = \dots \text{ nCi Pu-239}$$

EVALUACION DE Pu-238

$$C/S CAN 12-24 \times 0'048 - \text{FRACCION Am-241} = 0'011 = 0'037 \text{ c/s NETAS DE Pu-238}$$

$$C/S CAN 12-24 \times 0'037 \times C_f Pu-238 = 150 = 5'550 + 2'196 \text{ nCi Pu-238}$$

# CONTADOR DE RADIACTIVIDAD CORPORAL

SERIE N°

13

APELLIDOS:

NOMBRE: TPO

ESPEJOR TORACICO: 1'14 cm.

PROCEDENCIA PALOMARES (ALTERIA)

FECHA: 20 FEBRERO

CAN 12-24	320	c.t.	0'160	c/s	c/s CAN 75-100	0'516	x	0'163	=	0'084	FONDO CORPORAL EN c/s CAN 12-24
CAN 50-70	972	c.t.	0'486	c/s	c/s CAN 75-100	0'516	x	0'983	=	0'507	FONDO CORPORAL EN c/s CAN 50-70
CAN 75-100	1032	c.t.	0'516	c/s	c/s CAN 12-24	0'160	-	0'084	=	0'076	c/s NETAS
					c/s CAN 50-70	0'486	-	0'507	=		c/s NETAS

EVALUACION DE Am-241

c/s CAN 50-70 x C<sub>f</sub> Am-241 = nCi DE Am-241

EVALUACION DE LA FRACCION DE Am-241 EN CAN 12-24

c/s CAN 50-70 x E<sub>f</sub> = FRACCION Am-241 EN CAN 12-24

EVALUACION DE Pu-239 EXISTIENDO Am-241

c/s CAN 12-24 - FRACCION Am-241 = c/s NETAS DE Pu-239

c/s CAN 12-24 x C<sub>f</sub> Pu-239 = nCi DE Pu-239

EVALUACION DE Pu-239 NO EXISTIENDO Am-241

c/s CAN 12-24 0'076 x C<sub>f</sub> Pu-239 230 = 17'480 : 4'558 nCi Pu-239

EVALUACION DE Pu-238

c/s CAN 12-24 - FRACCION Am-241 = c/s NETAS DE Pu-238

c/s CAN 12-24 0'076 x C<sub>f</sub> Pu-238 105 = 7'980 : 2'081 nCi Pu-238

# CONTADOR DE RADIOACTIVIDAD CORPORAL

SERIE Nº

13

APELLIDOS

NOMBRE

ESPOSOR TORACICO 1'74 cm

PROCEDENCIA PALOMARES (ALGERIA)

FECHA: 20 FEBRERO

CAN 12-24	394	c.t.	0'197	c/s	c/s CAN 75-100	0'764	x	0'163	=	0'125	FONDO CORPORAL EN c/s CAN 12-24
CAN 50-70	1627	c.t.	0'814	c/s	c/s CAN 75-100	0'764	x	0'983	=	0'751	FONDO CORPORAL EN c/s CAN 50-70
CAN 75-100	1528	c.t.	0'764	c/s	c/s CAN 12-24	0'197	-	0'125	=	0'072	c/s NETAS
					c/s CAN 50-70	0'814	-	0'751	=	0'063	c/s NETAS

## EVALUACION DE Am-241

c/s CAN 50-70 0'063 x C<sub>f</sub> Am-241 2'95 = 0'186 : 0'120 nci DE Am-241

## EVALUACION DE LA FRACCION DE Am-241 EN CAN 12-24

c/s CAN 50-70 0'063 x E<sub>f</sub> 0'196 = 0'012 = FRACCION Am-241 EN CAN 12-24

## EVALUACION DE Pu-239 EXISTIENDO Am-241

c/s CAN 12-24 0'072 - FRACCION Am-241 0'012 = 0'060 c/s NETAS DE Pu-239

c/s CAN 12-24 0'060 x C<sub>f</sub> Pu-239 420 = 25'200 : 11'161 nci DE Pu-239

## EVALUACION DE Pu-239 NO EXISTIENDO Am-241

c/s CAN 12-24 x C<sub>f</sub> Pu-239 = nci Pu-239

## EVALUACION DE Pu-238

c/s CAN 12-24 0'072 - FRACCION Am-241 0'012 = 0'060 c/s NETAS DE Pu-238

c/s CAN 12-24 0'060 x C<sub>f</sub> Pu-238 190 = 11'400 : 5'049 nci Pu-238

# CONTADOR DE RADIACTIVIDAD CORPORAL

SERIE N°

13

APELLIDOS: NOMBRE: FECHA: 21 FEBRERO

ESPESOR TORACICO: 1'33 cm PROCEDENCIA: PALOMARES (ALGERIA)

CAN 12-24	226	C.T.	0'1113	c/s	CAN 75-100	0'394	x	0'1163	=	0'064	FONDO CORPORAL EN c/s CAN 12-24
CAN 50-70	745	C.T.	0'373	c/s	CAN 75-100	0'394	x	0'983	=	0'387	FONDO CORPORAL EN c/s CAN 50-70
CAN 75-100	787	C.T.	0'394	c/s	CAN 12-24	0'113	-	0'064	=	0'049	c/s NETAS
					CAN 50-70	0'373	-	0'387	=		c/s FONDO CORPORAL =
											c/s NETAS

EVALUACION DE Am-241

$$c/s \text{ CAN } 50-70 \times C_f \text{ Am-241} = \text{ nCi DE Am-241}$$

EVALUACION DE LA FRACCION DE Am-241 EN CAN 12-24

$$c/s \text{ CAN } 50-70 \times E_f = \text{ FRACCION Am-241 EN CAN 12-24}$$

EVALUACION DE Pu-239 EXISTIENDO Am-241

$$c/s \text{ CAN } 12-24 - \text{ FRACCION Am-241} = \text{ c/s NETAS DE Pu-239}$$

$$c/s \text{ CAN } 12-24 \times C_f \text{ Pu-239} = \text{ nCi DE Pu-239}$$

EVALUACION DE Pu-239 NO EXISTIENDO Am-241

$$c/s \text{ CAN } 12-24 \times 0'049 \times C_f \text{ Pu-239} = 250 = 13'720 = 4'274 \text{ nCi Pu-239}$$

EVALUACION DE Pu-238

$$c/s \text{ CAN } 12-24 - \text{ FRACCION Am-241} = \text{ c/s NETAS DE Pu-238}$$

$$c/s \text{ CAN } 12-24 \times 0'049 \times C_f \text{ Pu-238} = 128 = 6'272 = 1'954 \text{ nCi Pu-238}$$